

**U.S. Fire Administration
National Fire Data Center**

Confined Structure Fires

February 2006



Homeland
Security

United States Fire Administration/National Fire Data Center

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Department of Homeland Security
United States Fire Administration
National Fire Data Center

UNITED STATES FIRE ADMINISTRATION MISSION STATEMENT

As an entity of the Department of Homeland Security, the mission of the USFA is to reduce life and economic losses due to fire and related emergencies, through leadership, advocacy, coordination, and support. We serve the Nation independently, in coordination with other Federal agencies, and in partnership with fire protection and emergency service communities. With a commitment to excellence, we provide public education, training, technology and data initiatives.

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CONFINED STRUCTURE FIRES

Introduction

Confined structure fires are small fire incidents that are limited in scope, are generally confined to noncombustible containers, rarely result in serious injury or large content losses, and are expected to have no accompanying property losses due to flame damage.¹ This report analyzes the characteristics of small fires that occur in structures that are contained or confined as recorded by fire department personnel completing the basic module of the U.S. Fire Administration's (USFA) National Fire Incident Reporting System (NFIRS) data collection report.

This is the first time that the U.S. Fire Administration has published an analysis on confined structure fires. While a great deal of data have been evaluated for this report and many questions have been addressed, much more remains to be learned about the widespread occurrence of small fires and how they are contained, or not contained.

When fire personnel record all fire incidents using a consistent methodology, they collect data that will affect their decision making about staffing and equipment, as well as their response mechanisms. Budget decisions are affected as well. Widespread cooperation from fire department personnel across the country has resulted in a clearer picture of such small fires than has ever been available in the past. Although this view is not yet transparent, it is helping to define new public education opportunities.

As studies of the unreported fire problem indicate that unreported fires tend to be small, low-loss, confined or contained fires, this investigation into similar fires—confined structure fires—may shed light on the characteristics of unreported fires as well.

Confined Fire Reporting

Information on small confined structure fires has been available in the past via the NFIRS data, but analysts have been aware of data collection issues that may have precluded full reporting of all these small fire incidents. In response to these concerns, the current version of NFIRS (version 5.0) includes new incident types that are specifically designed to identify these fires and facilitate data collection. Along with the identifying incident type, NFIRS 5.0 allows for abbreviated reporting of these small fires.

In NFIRS 5.0, the basic module is used for every incident. Where confined, or contained, structure fires are concerned, the basic fire module (a “short form”) could be the only report-

¹NFIRS distinguishes between “content” and “property” loss. Content loss includes loss to the contents of a structure due to damage by fire, smoke, water, and overhaul. Property loss includes losses to the structure itself or to the property itself. Total loss is the sum of the content loss and the property loss. For confined fires, the expectation is that the fire did not spread beyond the container (or rubbish for incident type 118) and hence, there was no property damage (damage to the structure itself) from the flames. There could be, however, property damage as a result of smoke, water, and overhaul.

ing module required. Contained, no-loss fires are simply reported using only the basic module, with as few as three codes having to be looked up and entered when using the paper forms.²

The basic incident module is limited in the information it provides, but it is still possible to glean important trends about confined structure fires from these data. A subgroup of the fire personnel who completed the basic incident module for confined structure fires went a step further and completed the NFIRS fire module as well, providing more detailed information about small fires that may have previously gone unreported.

NFIRS and Underreported Fires

Prior to the introduction of abbreviated reporting for small, no- or low-loss confined structure fires, there was concern that NFIRS reporting requirements may have discouraged participating fire departments from reporting all fires to the system, specifically these small fires. It is known anecdotally that some departments did not submit NFIRS data for minor fires such as food on stoves or chimney fires. These were incidents that might have gone wholly unreported prior to the introduction of NFIRS 5.0, incompletely reported (to minimize data collection), or were reported, but as a nonfire fire incident (with only incident identification information submitted) as little or no loss was involved. Some participating states routinely reported such non-loss fires as smoke scares. Thus, from a NFIRS reporting viewpoint, while the incident is reported, it is not identified as a fire incident with relevant data.

It is rare that a fire department does not track its own fires and most, if not all, fire departments have an accurate count—or at least a very good estimate—of the fires to which they respond. It is not clear whether these underreported fires were or were not included in the departments' reports elsewhere or the extent of the problem. The introduction of the confined/contained structure fire incident was designed to alleviate this issue.

Confined Fires and Unreported Fires

Both underreporting and unreported fires have been a concern to the fire service. Underreporting fires skews the data that are available. Unreported fires mask the full extent of the fire problem, regardless of the fire data available.

Unreported fires fall into roughly two categories: those not reported to the fire department (unreported fires) and those not reported by the fire department (underreported fires, addressed earlier). In the former case, it is by and large the minor fires that are not reported to fire departments—those fires that are very small and cause little damage beyond the immediate item—and, because they were small, the fires were either self-extinguishing or extinguished by the occupant and, in the estimation of the occupant, did not require a fire department response. In the 1984 Consumer Product Safety Commission's (CPSC's) study of unreported fires, an estimated 95 percent of unreported residential fires incurred losses of \$100 or less and at least 94 percent of unreported fires were either self-extinguished or extinguished by the

²National Fire Incident Reporting System 5.0 Complete Reference Guide, Chapter 1, January 2006 (CRG). The CRG is available online at http://www.nfirs.fema.gov/_download/nfirs50crg2006.pdf.

residents.^{3 4 5} Although it is likely that the vast majority of fire incidents are unreported because they are small, confined, and immediately extinguished, they are indeed still fires. Even the largest fire starts small; hence, all fires, regardless of size, merit prevention attention and analytic investigation.⁶

With the introduction of limited reporting of confined, no-loss structure fires in NFIRS 5.0, the cause profiles for reported structure fires, especially residential structure fires, have undergone an important change.⁷ These confined fires, generally of three types (cooking, heating-related (primarily chimney), or trash-related), now account for 38 percent of all reported residential fires in the NFIRS 5.0 data. Confined fires account for over half (53 percent) of those residential fires where cause information is available. Cooking (36 percent) and heating-related (15 percent) confined fires account for nearly all of these fires. The addition of these fires results in increased proportions of cooking and heating fires in analyses of fire cause. Cooking fires show large increases while heating fires show more modest ones. Another important change as a result of abbreviated reporting for confined fires is the potential for larger unknowns as detailed reporting of fire specifics (e.g., room of origin) is not required.

Methodology

Confined Structure Fires relies on data from the Nation's largest fire incident database, NFIRS, and on independent research from a variety of public and private organizations including the National Fire Protection Association (NFPA) and the CPSC. This report does not provide estimates of the number of confined fires nationally as the methodology for producing that estimate is not fully developed at this time.⁸

Major Data Source

The fire-related findings in this report are based primarily on analysis of NFIRS fire incident data for 2002. NFIRS is a voluntary data collection system administered by the United States Fire Administration (USFA), an agency under the Department of Homeland Security. The participating fire departments include career, volunteer, and combination departments that serve communities ranging from rural hamlets to the largest cities. Participation in NFIRS is state-based and voluntary. Not all states participate and for those that do, reported fire incidents do not reflect all of a state's fire activity. Also, not all recorded information is complete.

³1984 *National Sample Survey of Unreported, Residential Fires*, Final Technical Report, Audits & Surveys for the Consumer Product Safety Commission, Princeton, NJ

⁴This 1984 CPSC-sponsored study notes: "In most residential fire incidents, the residents attempted to extinguish the flames (87.2 percent of the incidents). Most often they were successful, and in only 4.5 percent of these instances was it necessary to summon the fire department. Where residents did not attempt to extinguish the fire, the fire department was summoned 11.6 percent of the time." From these statistics, it appears that 94.6 percent of the time, the fire was extinguished by the resident, self-extinguished, or extinguished by some other means and without the need of the fire department.

⁵The CPSC study notes that slightly more than 55 percent of the unreported fires had no loss and that slightly more than 39 percent of these fires had a loss from \$1 to \$100 (p. 32).

⁶Other fires not reported to the local fire department may include such incidents as commercial or industrial fires where an industrial fire brigade responds to the fire and fires that occur on military bases with a military fire brigade. This subgroup of unreported fires is thought to be small.

⁷It is important to note that it is the cause profile of the reported data that has changed. This change may not necessarily indicate a change in the fire situation, only in the understanding of the fire situation.

⁸NFIRS data for 2002 contains approximately one-third converted NFIRS version 4.1 data and two-thirds native NFIRS version 5.0 data. There is no equivalent incident type in NFIRS 4.1 for the confined fires incident type in NFIRS 5.0.

Nevertheless, each year of NFIRS data contains between 540,000 and 800,000 records, each representing a separate fire incident.

Adjusted Percentages in Fire Data

In making national estimates of the fire problem, unknown or undetermined data in the NFIRS database are not ignored. Unknown data occur when the information in nonrequired data collection items in NFIRS is not provided (left blank), the coding provided is invalid, or the information is noted as “undetermined.” The approach taken in this report is to provide an “adjusted” percentage that is computed using only those incidents for which the valid information was provided for the data item being analyzed. In effect, this distributes the unknown responses in the same proportion as the known responses for the data item.

Definition of Confined Fire

For the purposes of this report, confined fires are defined as fires in buildings that are confined to noncombustible containers and where there is no flame damage beyond the noncombustible container.⁹ These fires are defined by six very specific incident types:¹⁰

- Incident Type 113: Cooking fire involving the contents of a cooking vessel without fire extension beyond the vessel
- Incident Type 114: Chimney or flue fire originating in and confined to a chimney or flue. Excludes fires that extend beyond the chimney (incident types 111 or 112)
- Incident Type 115: Incinerator overload or malfunction, but flames cause no damage outside the incinerator
- Incident Type 116: Fuel burner/boiler, delayed ignition or malfunction, where flames cause no damage outside the fire box
- Incident Type 117: Commercial compactor fire, confined to contents of compactor. Excluded are home trash compactors
- Incident Type 118: Trash or rubbish fire in a structure, with no flame damage to structure or its contents.

Examination of Confined Fire Data

The fire prevention and analysis community has been interested in understanding the nature and extent of small, often unreported, fires for some time. Most of these fires are confined in some manner, and it was widely believed, but unproven, that when a fire department is called for one of these small fires, the fires were sometimes classified as “smoke scares,” and thus do not obligate the fire department to complete extensive reports. In an effort to collect data on at least some of the very small fires that typically go unreported, and for a more accurate picture of the fire situation, NFIRS began collecting data on small, confined fires. The results have been enlightening.

⁹This definition is from the *National Fire Incident Reporting System 5.0 Complete Reference Guide*, Chapter 1, January 2006 (CRG).

¹⁰These definitions are also from the *National Fire Incident Reporting System 5.0 Complete Reference Guide*, Chapter 3, January 2006 (CRG).

The 2002 NFIRS data contain abbreviated reporting for 52,006 confined fire incidents. These incidents accounted for \$26 million in combined losses, 3 deaths, and nearly 500 injuries. Per fire, these losses are far lower than the average structure fire in 2002 (Table 1).

Table 1. Confined Structure Fires (2002)

Loss Measure	Loss	Loss/1,000 Confined Fires	Loss/1,000 Structure Fires
Fires	52,006		
Deaths	3	< 0.1	5.1
Injuries	471	9.1	30.5
Dollar Loss	\$25,887,032	\$498 (per fire)	\$14,252 (per fire)

Source: NFIRS 5.0 data only

Distribution of Fires

More than half of all confined fires are confined cooking fires. Of the 52,006 confined fires reported through NFIRS in 2002, 57 percent were cooking fires, 19 percent were trash or rubbish fires, and 17 percent were chimney fires.¹¹ When heating-related confined fires (chimney and fuel burners) are grouped together, these types of confined fires become the second leading group of fires at 23 percent (Table 2).

Table 2. Confined Structure Fires by Incident Type (2002)

Incident Type	Fires	Percent
113 Cooking	29,706	57.1
114 Chimney/Flue	8,638	16.6
115 Incinerator	284	0.5
116 Fuel Burner	3,226	6.2
117 Commercial Compactor	246	0.5
118 Trash/Rubbish	9,906	19.0
Total	52,006	100.0

Source: NFIRS 5.0 data only

Losses

Contents and Property Loss. By definition, losses associated with confined fires are small. Because a confined fire is limited to the container where it started, some contents losses can be expected but in general, such losses are expected to be minimal. Likewise, a fire confined to its container of origin is not expected to generate much, if any, property loss. The data show, however, that while some of these fires may indeed be confined to the container, the container it-

¹¹The percentage of confined cooking fires is in line with CPSC's last study of unreported fires (see footnote 3). In that study, 53 percent of all the unreported residential fires were linked to fires involving kitchen cooking equipment. This percentage is derived from pp. 36-37 where 68.4 percent of unreported residential structure fires involved appliances and 77.7 percent of unreported structural appliance fires were cooking/kitchen appliances or equipment. The resulting computation, $0.684 \times 0.777 = 0.531$ or 53.1 percent. This statistic is particularly relevant if it is believed that the confined fires captured in NFIRS 5.0 reflect fires previously unreported either to the fire service or by the fire service.

self, such as an oven, furnace, or incinerator, may be a relatively expensive item and losses resulting from fire damage to these containers may be substantial. Also by definition, losses associated with confined fires are limited to the contents of the container. The data, however, show exceptions to this definition.

Of the 52,006 confined fires in the 2002 data, 13.6 percent reported losses with an average loss of \$3,657. Property losses exceeded content losses by 29 percent. Property losses were reported in 4,711 confined fire incidents, representing 9.1 percent of all confined fires in the NFIRS data that year. The average property loss was \$2,058. Content losses were reported for 4,520 incidents, slightly less than 9 percent of confined fires, with an average loss of \$1,599. Further details are shown in Tables 3 and 4.

**Table 3. Dollar Loss Summary, Confined Structure Fires:
Percent of Loss by Dollar Loss Category (2002)**

Loss Category	Fires	%	Overall Loss	%
Contents Only	2,368	4.6	\$ 2,743,893	10.6
Property Only	2,559	4.9	4,973,152	19.2
Contents and Property	2,152	4.1	18,169,987	70.2
Any Content Loss	4,520	8.7	20,913,880	80.8
Any Property Loss	4,711	9.1	23,143,139	89.4
Any Loss	7,079	13.6	25,887,032	100.0
No Losses	44,927	86.4	—	—
Overall	52,006		\$25,887,032	

Source: NFIRS 5.0 data only

**Table 4. Dollar Loss Summary, Confined Structure Fires:
Loss/Fire by Dollar Loss Category (2002)**

Loss Category	Overall Loss	Loss/Fire	Contents	Loss/Fire	Property	Loss/Fire
Contents only	\$ 2,743,893	\$1,159	\$ 2,743,893	\$1,159	—	—
Property only	4,973,152	1,943	—	—	\$ 4,973,152	\$1,943
Contents and Property	18,169,987	8,443	8,572,802	3,984	9,597,185	4,460
Any Content Loss	20,913,880	4,627	11,316,695	2,504	9,597,185	2,123
Any Property Loss	23,143,139	4,913	8,572,802	1,820	14,570,337	3,093
Any Loss	25,887,032	3,657	11,316,695	1,599	14,570,337	2,058
No Losses						
Overall	\$25,887,032	\$ 498	\$11,316,695	\$ 218	\$14,570,337	\$ 280

Source: NFIRS 5.0 data only

Fires With Content Loss. For those fires that are more closely associated with the original intent of the confined fire concept—those with only content losses and minor injuries—Table 5 indicates that only a modest percentage of these fires (11.7 percent) have content losses in excess of \$1,000.

When the group of fires with content loss includes all fires with content losses (that is, those fires above with only content losses and fires that have both content and property losses), the average total losses increase substantially. Not surprisingly, the fires with the greatest total loss also tend to have more fire spread.

Table 5. Content Loss Distribution, Confined Structure Fires (2002)

Content Loss Range	Fires with Content Loss Only	Average Content Loss (Total Loss)	All Fires with Content Loss	Average Content Loss	Average Total Loss
\$1-\$250	1,306	\$84	2,520	\$65	\$954
\$251-\$500	501	\$432	793	\$437	\$1,167
\$501-\$1,000	285	\$923	613	\$949	\$2,431
> \$1,000	276	\$7,810	594	\$17,214	\$27,097
Incidents	2,368		4,520		

Source: NFIRS 5.0 data only

Casualties. While confined fires were designed to capture no-loss fires, as with contents loss, it is reasonable to expect some injury associated with these fires. It is conceivable, for example in a confined cooking fire, that an individual sustained a burn either in the ignition of the fire or in reaction to the fire (e.g., placing a lid on the container.). As shown in Table 6, confined fires reported to NFIRS in 2002 resulted in 471 injuries. Confined cooking fires resulted in by far the largest number of injuries. Not surprisingly, these injuries occurred in residential properties—in fact, 82.2 percent of all confined fire injuries occurred in residential properties.

In addition to the injuries, three deaths were also reported as a result of confined fires. Some specifics of this incident are listed in Table 7. From the dollar loss information and the

Table 6. Injuries Associated with Confined Structure Fires (2002)

Property Use	Incident Type						Total
	Cooking	Chimney/Flue	Incinerator Overload	Fuel Burner	Commercial Compactor	Trash/Rubbish	
Public Assembly	12			2		3	17
Educational						1	1
Institutional	5					1	6
Residential	387	8		15	1	13	424
Mercantile/Business	1	1					2
Industrial				1		1	2
Manufacturing	2	2	5	1			10
Storage						2	2
Outside/Special Property	2					4	6
Other/Unknown	1						1
Total	410	11	5	19	1	25	471

Source: NFIRS 5.0 data only

Table 7. Deaths Associated with Confined Structure Fires (2002)

Item	Incident Information
Incident Type	116: Confined Fuel Burner
Fire Spread, if any	No information
Fires	1
Deaths	3
Injuries	0
Total Loss	\$296,000
Property Loss	\$203,000
Contents Loss	\$93,000

Source: NFIRS 5.0 data only

number of deaths, it is apparent that this incident may have been incorrectly coded as a confined fire incident.

Fire Spread

Virtually all confined fires are restricted to the object (99.1 percent) or to the room of origin (0.7 percent). In confined fires with content or property loss, there is a small percentage of fires (3.3 percent) that move beyond their containers. Not surprisingly, fires that move beyond their containers are those with the highest losses per fire as shown in Table 8.

Table 8. Fire Spread in Confined Structure Fires (2002)

Fire Spread	Confined Fires	%	Confined Fires with Loss	%	Overall Loss	Loss/Fire
Confined to Object of Origin	51,562	99.1	6,846	96.7	\$24,271,488	\$ 3,545
Confined to Room of Origin	375	0.7	202	2.9	962,244	4,764
Confined to Floor of Origin	19	0.0	11	0.2	108,000	9,818
Confined to Building of Origin	46	0.1	19	0.3	455,300	23,963
Beyond Building of Origin	4	0.0	1	0.0	90,000	90,000
Total	52,006	100.0	7,079	100.0	\$25,887,032	

Source: NFIRS 5.0 data only

Of interest is the distribution of fire spread for those incidents where more detailed fire-related information is available. About 20 percent of confined fire incidents also have information beyond the standard abbreviated reporting. Of these incidents, 64 percent reported information on fire spread, and as expected of confined fires, the large majority (94 percent) was confined to the object of origin. For a subset of incidents where fire spread is a required variable (enclosed buildings or fixed portable or mobile structures) however, only 78 percent are confined to the object of origin. In fact, the majority of the fires in Table 8 above with fire spread beyond the object of origin are enclosed buildings or fixed portable or mobile structures (424 of 444 fires), casting doubt as whether these “building fires” are truly confined fires.

Property Use and Structure Type

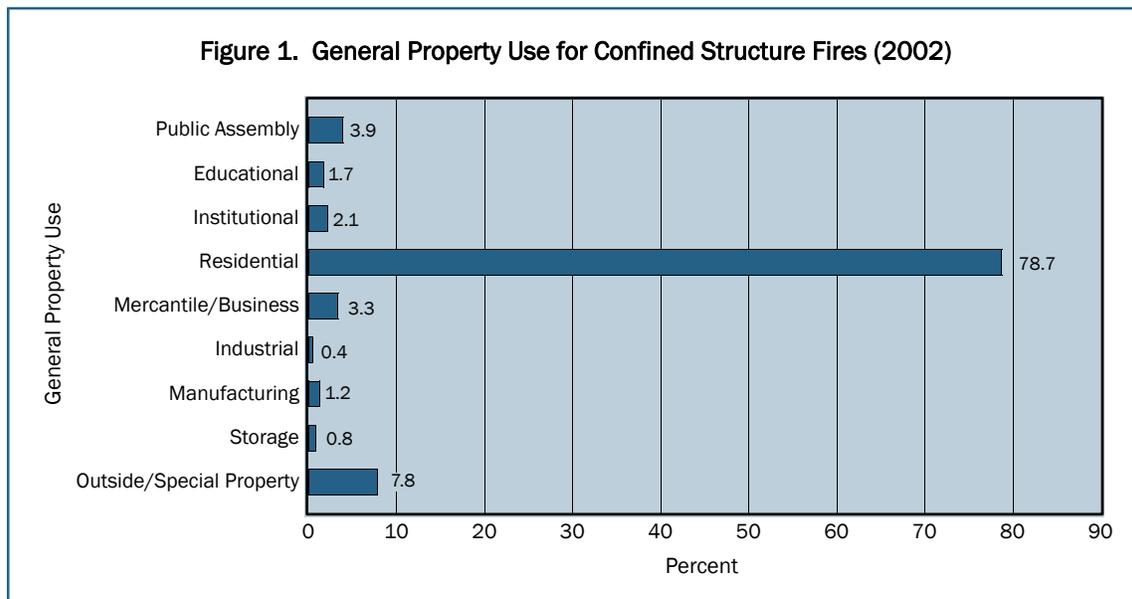
Over three-quarters of all confined fires (77.5 percent) occurred on residential properties (Table 9). When only specific property types are considered, this proportion rises slightly to 78.7 percent as shown in Figure 1. For the subset of confined fires with additional information on structure type (1,982 fires), nearly 96 percent occurred in enclosed structures—structures usually associated with buildings (Table 10).

Table 9. General Property Use by Incident Type for Confined Structure Fires (2002)

Property Use	Incident Type						Total
	Cooking	Chimney/ Flue	Inclinerator Overload	Fuel Burner	Commercial Compactor	Trash/ Rubbish	
Public Assembly	1,259	103	8	124	10	504	2,008
Educational	351	12	6	63	5	424	861
Institutional	829	6	11	61	3	141	1,051
Residential	25,885	8,055	148	2,548	33	3,613	40,282
Mercantile/Business	745	95	24	190	43	603	1,700
Industrial	28	12	15	32	8	112	207
Manufacturing	67	129	54	98	69	206	623
Storage	45	39	6	42	11	284	427
Outside/Special Property	238	23	7	22	55	3,661	4,006
Other/Unknown	259	164	5	46	9	358	841
Total	29,706	8,638	284	3,226	246	9,906	52,006

Source: NFIRS 5.0 data only

Figure 1. General Property Use for Confined Structure Fires (2002)



Based on 51,165 incidents or cases reported to NFIRS with known property use.
Source: NFIRS 5.0 data only

Table 10. Structure Type by Incident Type for Confined Structure Fires (2002)

Structure Type	Incident Type						Total
	Cooking	Chimney/ Flue	Incinerator Overload	Fuel Burner	Commercial Compactor	Trash/ Rubbish	
Enclosed Building	1,170	398	5	145	7	174	1,899
Fixed*	22	5		3		14	44
Open	3	3	1	1		8	16
Air-Supported	1	1					2
Open Platform	1	2			1	4	8
Connective	6	3		1	1	2	13
Other/Unspecified	4,610	1,800	49	398	56	2,236	9,149
Total	5,813	2,212	55	548	65	2,438	11,131

*The full name of this category is "Fixed Portable or Mobile Structure."
Source: NFIRS 5.0 data only

Human Factors

Human intervention, neglect, or inappropriate behavior can all result in fire incidents. Based on the NFIRS fire reports that included fire module data, several human factors have a substantial influence. Unattended heat use or unsupervised activities are the most common human factors that result in confined fires collectively and, with the exception of incinerator overload, across each incident type (Tables 11 and 12).

Table 11. Reported Numbers of Confined Structure Fires by Human Factors Contributing to Ignition (2002)

Incident Type	Asleep	Alcohol/ Drugs	Unattended/ Unsupervised	Mental Disability	Physical Disability	Multiple Persons	Age	No Contributing Human Factors	Total Contributing Factors
Cooking	232	102	1,269	40	27	53	138	3,833	5,694
Chimney/Flue	20	3	46	1	3	16	5	1,942	2,036
Incinerator Overload	2		1				1	35	39
Fuel Burner	4	2	7	1		2	3	439	458
Commercial Compactor			4					53	57
Trash/Rubbish	11	19	163	16	5	35	45	1,900	2,194
Total	269	126	1,490	58	35	106	192	8,202	10,478
Factors	2.6%	1.2%	14.2%	0.6%	0.3%	1.0%	1.8%	78.3%	
Contributing Factors	11.8%	5.5%	65.5%	2.5%	1.5%	4.7%	8.4%		

Based on 10,478 incidents or cases with "human factor" information reported to NFIRS.
Source: NFIRS 5.0 data only

**Table 12. Human Factors Contributing to Ignition by Confined Structure Incident Type:
Percent of Contributing Factors (2002)**

Incident Type	Fires with Contributing Human Factors							Total
	Asleep	Alcohol/ Drugs	Unattended/ Unsuper- vised	Mental Disability	Physical Disability	Multiple Persons	Age	
Cooking	12.5	5.5	68.2	2.1	1.5	2.8	7.4	100.0
Chimney/Flue	21.3	3.2	48.9	1.1	3.2	17.0	5.3	100.0
Incinerator Overload	50.0		25.0				25.0	100.0
Fuel Burner	21.1	10.5	36.8	5.3		10.5	15.8	100.0
Commercial Compactor			100.0					100.0
Trash/Rubbish	3.7	6.5	55.4	5.4	1.7	11.9	15.3	100.0
Total	11.8	5.5	65.5	2.5	1.5	4.7	8.4	100.0

Based on 10,478 incidents or cases reported to NFIRS.
Source: NFIRS 5.0 data only

Monthly Trends

There are interesting patterns in the occurrence of confined fires. The majority of such fires occur between October and March with peaks in the winter (December–January). Confined fires are less frequent in the summer, as can be seen from Figure 2.

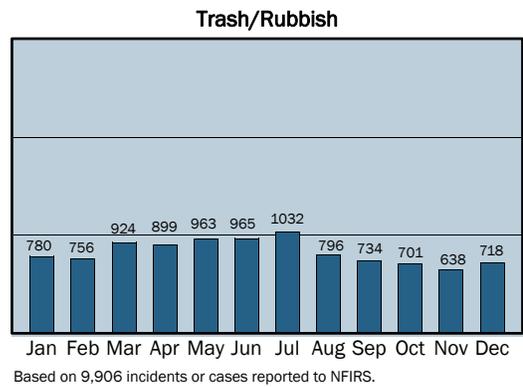
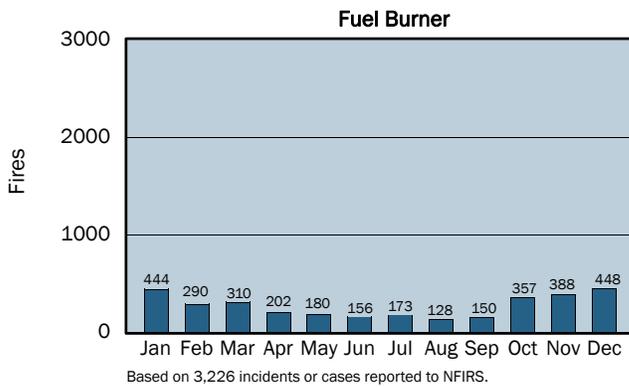
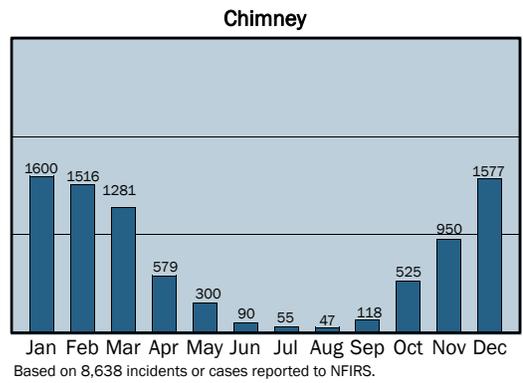
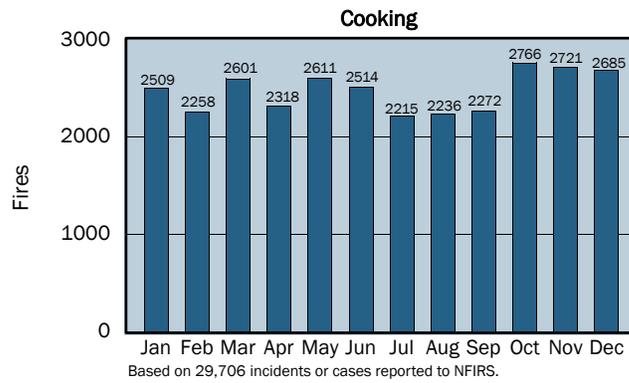
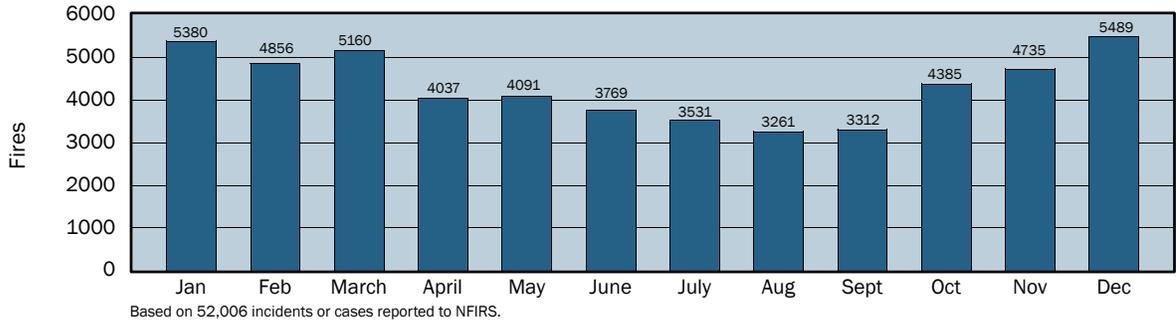
Summer months see slightly fewer confined cooking fires but overall, these cooking fires are relatively steady throughout the year (Figure 2). Although cooking is the predominant reason for a confined fire, the overall trends are little affected by the number of these fires each month.

As can be seen in Figure 3, it is the heating-related incidents that explain the overall pattern in monthly trends in confined fires. Confined chimney fires are more likely to occur than any of the other incident categories, except for confined cooking fires. As such, it is the influence of confined chimney fires that determines the occurrence pattern of all confined fires (Figure 2). Fuel burner fires, though less numerous, follow the chimney fire monthly trend patterns to a noticeable degree (Figure 2). Both of these confined fires incident types are associated with the heating spike during the winter season.

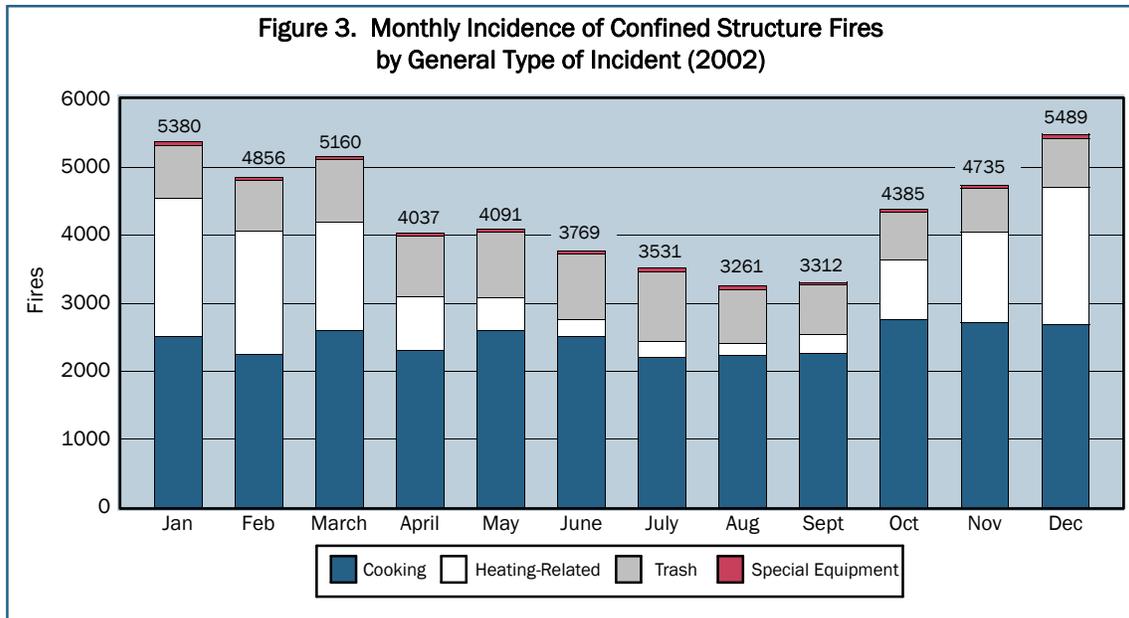
Trash and rubbish fires are most numerous during the late spring and early summer months, perhaps a by-product of increased outdoor activity in these months (Figure 2). In the 2002 data, there were more confined trash fires (9,906) than chimney fires (8,638).

Confined incinerator and commercial compactor fires (combined as “special equipment” in Figure 3) averaged 44 per month in the NFIRS data, with a slight increase in the summer months. As can be seen, their influence on the overall monthly trends in confined fires is extremely limited.

Figure 2. Monthly Incidence of Confined Structure Fires (2002)



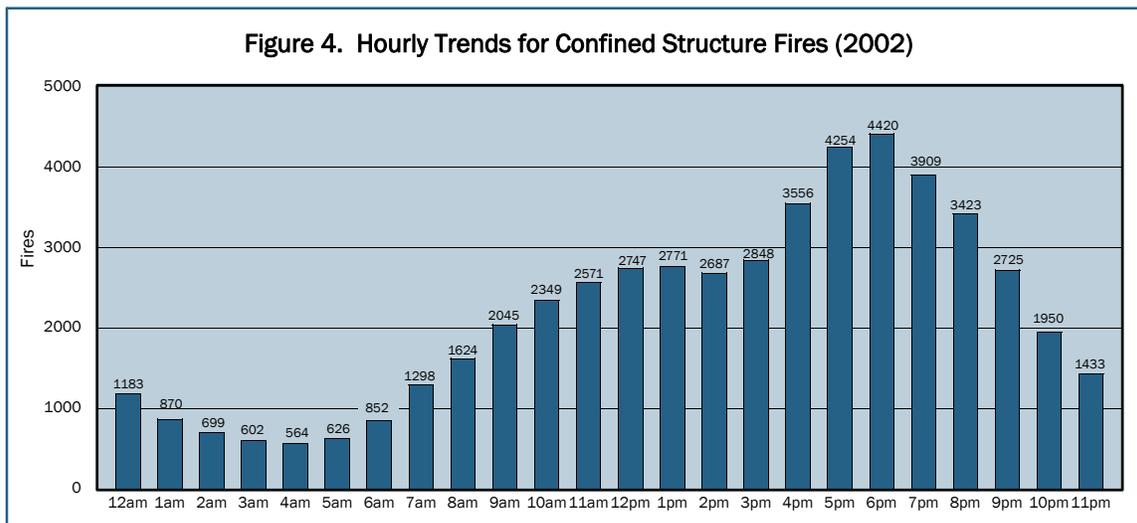
Source: NFIRS 5.0 data only



Based on 52,006 incidents or cases reported to NFIRS.
Source: NFIRS 5.0 data only

Time of Day

Confined fires typically occur during waking hours. The hourly distribution of these fires are dominated by that of cooking fires and tend to peak with the lunch and dinner hours (Figure 4).



Based on 52,006 incidents or cases reported to NFIRS.
Source: NFIRS 5.0 data only

Smoke Alarms¹²

The 1984 National Sample Survey of Unreported, Residential Fires found that the increase in use of smoke alarms at that time led to an increase in the number of small, unreported fires. It was speculated that the early detection of these small fires allowed residents to extinguish them without calling the fire department. When smoke alarms were present during a fire, the alarm operated 30 percent of the time. At that time, 62 percent of households had smoke alarms; today, over 90 percent of households have alarms.¹³

Smoke alarms play the same vital role in early detection in these small fires in 2002. In the more than half of confined fires (53 percent) where alarm alert information was provided, alarms alerted occupants 63 percent of the time.¹⁴ With the approximate 50 percent increase in the prevalence of smoke alarms today, this doubling of smoke alarm operation in small fires is a welcome increase.

Where more detailed information is provided in the fire module, smoke alarms operated in 71 percent of the incidents. But some confined fires were just too small to cause the alarm to operate, and in a very limited number of cases the alarm failed to operate altogether (Tables 13 and 14).

**Table 13. Smoke Alarm Alert Status,
Confined Structure Fires (2002)**

Alert Status	Fires	Percent	Percent Alerted
Occupants Alerted	17,207	33.1	62.7
Occupants Not Alerted	10,244	19.7	37.3
Alert Status Unknown	24,512	47.1	
No Information Reported	43	0.1	
Total	52,006	100.0	100.0

Source: NFIRS 5.0 data only

¹²The term *smoke alarm* has superseded the more commonly known term *smoke detectors*. While the two terms are not technically identical, in industry parlance, *smoke alarm* underscores that when the “detector” detects smoke, it also sounds an alarm to alert the occupants of the fire.

¹³CPSC reported over 90 percent of households had smoke alarms (Press Release, “CPSC Warns the Smoke Detectors in About 16 Million Homes Do Not Work,” October 29, 1999, <http://www.cpsc.gov/CPSCPUB/PREREL/prhtml00/00011.htm>). Research from the National Fire Protection Association suggests as many as 96 percent of households have smoke alarms installed (U.S. Experience with Smoke Alarms and Other Fire Detection/Alarm Equipment, November 2004).

¹⁴The percentage of occupants alerted varies slightly (from 63 to 65 percent) depending on the methodology used to analyze the data. That separate methodologies yield similar results gives support to the results.

Table 14. Smoke Alarm Operation Status, Confined Structure Fires (2002)

Operation Status	Fires	Percent	Percent Operation
Fire Too Small To Activate Detector	232	2.1	19.8
Detector Operated	836	7.5	71.2
Detector Failed To Operate	106	1.0	9.0
Operation Status Unknown	113	1.0	
No Information Reported	9,844	88.4	
Total	11,131	100.0	100.0

Source: NFIRS 5.0 data only

Summary

Small fires confined to the containers or vessels where they originate are most generally caused by cooking and, where additional information is available, inattentive behavior. Injuries are infrequent and deaths are rare. Confined structure fires tend to occur more often in the winter months as a result of the increase in heating-related confined fires; cooking confined fires tend to occur somewhat uniformly year-round. Confined fires are limited in scope and severity, but not in potential for disaster. Even small fires can grow rapidly. Smoke alarms have helped reduce the risk from these fires, but the need for a public education program about cautious cooking, heating, and trash disposal continues to be great.

To ensure the robustness of the data collected under the new abbreviated reporting option of NFIRS 5.0, several data collection concerns need to be addressed. According to the *Complete Reference Guide (CRG)* for NFIRS 5.0, confined fire codes are to be used for fires in buildings that are confined to noncombustible containers when there is no flame damage beyond the noncombustible container.¹⁵ The two conditions noted here are not consistently enforced in the data collection process. Structures other than buildings are included as are fires that incur damage beyond the containers.

The CRG also notes that “contained, no-loss fires are simply reported using only the Basic Module.”¹⁶ From the data collected, it is clear that often enough the container itself is damaged. Perhaps a more realistic approach might be to modify the requirement and change “no-loss” to “low-loss” and define a reasonable loss threshold.

Loss thresholds for casualties also should be re-examined. It is not clear if the original intention of no-loss confined fires was to extend to no losses in casualties. As noted, injuries may result from even the smallest fires. Deaths, however, are not an expected result of confined fires. Arguably, it is possible that a death could occur, especially if the fire smoldered and pro-

¹⁵National Fire Incident Reporting System 5.0 Complete Reference Guide, January 2006, p 3–20: “For fires in buildings that are confined to noncombustible containers, use codes 113–118 of the structure fire codes when there is *no flame damage beyond the noncombustible container.*” Italics added for emphasis.

¹⁶National Fire Incident Reporting System 5.0 Complete Reference Guide, January 2006, p. 1–4.

duced sufficient toxic fumes to overcome the victims. In these cases, however, the confined fire incident types should not be allowable—any incident that results in serious losses (deaths, property loss, or high content losses) should be required to provide the detailed information contained in the fire incident module. These and other data considerations should be pursued more thoroughly to improve both NFIRS data quality overall and the usefulness of the data collected on confined fire incidents.¹⁷

Training on the proper NFIRS conventions and requirements as well as tighter data entry controls are tools that may be explored as avenues to achieve more consistent data quality.

In addition, this preliminary analysis of confined fire incidents has led to a new understanding of the analyses involved in determining the presence and effectiveness of smoke alarms in all structure fires as well as in these confined fires. Further investigations into the appropriate methodologies for smoke alarm analyses would be useful to the fire community at large.

¹⁷Two important areas to also consider in further investigations are how confined fires are treated in the cause methodology and, when equipment is reported as involved in ignition, whether the equipment is consistent with the incident type (e.g., toaster oven as equipment in a fuel burner incident).